

REMARKS

The Office Action dated March 31, 2008 has been received and noted. The following remarks are being submitted as a full and complete response thereto. Authorization is granted to charge counsel's Deposit Account No. 01-2300, referencing Attorney Docket No. 030687-00586, for any additional fees necessary for entry of this Response. Reconsideration of this application is respectfully requested in view of the following remarks.

By the foregoing amendment, the specification has been amended in response to the Examiner's objections. Independent claims 1, 8 15 and 24 have been amended. Support for the amendments to claims 1, 8 15 and 24 can be found in the originally filed specification, in particular in paragraph [00014]. Claims 1-21 and 24-31 are currently pending and subject to examination.

Informal Matters

In the Office Action, the specification was objected to for informalities. The objection is accordingly respectfully traversed. Although the Applicants respectfully disagree with the Examiner's characterization of the relationship between the motion unit 116 and the robot 100, paragraph [0013] has been amended in response to the Examiner's objection. Reconsideration is requested.

Rejections Under 35 U.S.C. § 112

Claims 1, 8, 15 and 24 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The rejections are respectfully traversed and reconsideration is requested.

With respect to rejections, the claims have been amended in response thereto. In particular, these claims have been amended so that the relationship between the counters and the detectors is “evident in the claim language,” as suggested on page 6 of the Office Action. Claims 8 and 24 have also been amended with regard to the relationship between the data and the memory device, according to the Examiner’s suggestions. However, suggested changes to the reference to “an array” of detectors have not been made. The Examiner argues that “the claims recite ‘an array of detectors’ while the specification describes a 2D or two-dimensional array of detectors.” The Applicants respectfully point out that a two-dimensional array of detectors is, in fact, an array of detectors and that the claims do not require further limitations to be added, as is apparently suggested by the Examiner. Accordingly, it is respectfully submitted that claims 1, 2, 4-9, 11-16, 18-21, 24, 25 and 27-31 are not indefinite and satisfy the written description requirement. The Applicants respectfully request that the 35 U.S.C. § 112 rejections relating to these claims be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Independent claims 1, 8 15 and 24 and dependent claims 3, 10, 17 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ruffner (US Patent No. 6,338,013) in view

of Maimon (US Patent No. 6,480,265). The rejections are respectfully traversed and reconsideration is requested.

Particularly with respect to independent claims 1, 8 15 and 24, it is submitted that Ruffner, either considered independently or in the alleged combination with Maimon, neither discloses nor suggests the robot or associated method, as claimed.

More particularly, amended independent claim 1 recites a robot comprising, in part, a memory device with a time value associated with a detection of the array of detectors, an infrared sensor operatively coupled to the memory device, the infrared sensor including: (a) an infrared light source configured to produce a plurality of pulses of infrared light directed toward an environment of the robot; and (b) at least one optics configured to focus a plurality of reflections of the infrared light pulses from the environment of the robot to the array of detectors; and at least one processor operatively coupled to the memory device, the processor operable to determine distance information based at least in part on the determined time value.

Similarly, amended independent claim 8 recites a method comprising, in part, storing data in a memory device of a robot, the data corresponding to at least one counter configured to determine a time value associated with a detection of an array of detectors; producing a plurality of pulses of infrared light directed toward an environment of the robot; focusing with at least one optic a plurality of reflections of the infrared light pulses from the environment of the robot to the array of detectors causing the detection of the array of detectors; and processing the determined time value to determine distance information based at least in part on the determined time value.

Similarly, amended independent claim 15 recites a robot comprising, in part, a memory device with a time value associated with a detection of the detectors, an infrared light source operatively coupled to the memory device and configured to produce a plurality of pulses of infrared light directed toward an environment of the robot; at least one optic operably coupled to the memory device and configured to focus a plurality of reflections of the infrared light pulses from the environment of the robot to the array of detectors causing the detection of the array of detectors; and at least one processor operatively coupled to the memory device, the processor operable to determine distance information based at least in part on the determined time value.

Similarly, amended independent claim 24 recites a method comprising, in part, storing data in a memory device of a robot, the data corresponding to at least one counter configured to determine a time value associated with a detection of an array of detectors; producing a plurality of pulses of infrared light directed toward an environment of the robot; focusing with at least one optic a plurality of reflections of the infrared light pulses from the environment of the robot to the array of detectors causing the detection of the detectors; and processing the determined time value to determine the distance information based at least in part on the determined value.

Ruffner does not disclose or suggest using infrared light, as claimed in the independent claims, or any other kind of electromagnetic radiation for detection. The Examiner acknowledged as much on page 11 of the previous Office Action of August 7, 2007 and is implicitly acknowledged again by the Examiner on page 3 of the instant Office Action. Rather, the Examiner points out, Ruffner uses ultrasonic pulses that “travel much slower than electromagnetic pulses and so require much less complex electronics to capture the process.”

Accordingly, it is submitted that Ruffner does not disclose or suggest using infrared light, as claimed in the amended independent claims.

In an attempt to make up for the deficiency of Ruffner with respect to using infrared radiation for distance detection, the Examiner relies on Maimon. Once again, with respect to the rejection of Ruffner in view of Maimon, it is respectfully submitted that the combination is an improper basis for an obvious rejection because Maimon teaches away from, at least, the amended independent claims. See, M.P.E.P. §2141.02.

Maimon generally discloses an active target distance measurement method that uses reflections of electromagnetic pulses. The technique of Maimon measures “the energy of the reflected beam over a gating interval to produce a gated energy. The gated energy is compared with a calibration energy to produce a ratio which is inversely proportional to the object distance.” (column 1, lines 47-51). That is, the technique of Maimon relies on a measurement that ascertains the energy of a reflected pulse. It does not rely on a measurement of the timing of a reflected pulse. In fact, Maimon specifically points out that distance measurements as disclosed are inherently superior to measurements of the timing of a reflected pulse in column 1 of Maimon. The active measurement technique claimed in the amended independent claims, in contrast to the energy measurement of Maimon, measures a time value associated with a detection of reflected infrared light. The active measurement technique of Maimon is actually designed to overcome the problems associated with such a method. In particular, Maimon discloses in column 1, lines 30-35 that “[t]he time of fly method requires extremely high measurement accuracy and thus relatively complex electronics. It is thus impractical to produce time of fly based apparatus as an array [...]” Thus, far from teaching the measurement claimed

in the independent claims, as the Examiner contends, Maimon discloses an entirely different method based on energy methods and it is suggested that such actually teaches away from the claimed method.

As described above, the amended independent claims each includes processing a determined time value that is associated with a detection of an array of detectors caused by reflecting infrared light off an object. In other words, the instant claims claim measuring a delay time to reflect infrared light, originally emitted from the robot, from an object to measure distance. Far from being disclosed by Maimon, this is contrary to the teachings above that such a technique is actually “impractical.” Maimon provides a technique, as described in column 1, lines 18-35, as an alternative to the claimed technique. In any event, adding the technique of Maimon to the device of Ruffner, as proposed by the Examiner, would not disclose or suggest the robot or method, as claimed in claims 1, 8, 15 and 24. Rather, this combination arrives at an apparatus that operates in an entirely different manner, as discussed in above cited portions of Maimon.

The Examiner contends, on page 7 of the Office Action, that “Maimon’s method does involve timing.” The Examiner then explains how Maimon’s method ascertains the energy of various reflected pulses over a specified time period. This period is specifically chosen, as Maimon explains in column 4, lines 48-51, such that “a gating width [...] is preferably twice the width of the pulse so that all the reflected pulse energy is measured.” Maimon further explains from column 4, line 65 to column 5, line 2 that, subsequent to the calibration described above, the ‘gate duration is equal to the pulse duration.’ Thus, Maimon is not measuring dynamic time values associated with the detection of a reflected pulse. Rather, Maimon is measuring pulse

energies over specified and static time periods. Maimon does not disclose a time value that is “associated with a detection of an array of detectors” where detection of the array of detectors occurs with the detection of reflected infrared light, as claimed. Rather, it is respectfully submitted, any time values in the measurement of Maimon are pre-determined specifically for the purposes of ascertaining pulse energies. Accordingly, they do not measure the timing of the reflected pulse, as claimed.

As the Examiner point out, Maimon does discuss the relationship of the measured energy and timing, i.e., “the total received energy depends on any offset between the gate period and the duration of receipt of the pulse, i.e., the delay due to the time of flight” (column 5, lines 1-3). Here Maimon reiterates that the time of flight is not measured. Rather, the energies measured over specified (and static) time periods depend on the delay due to time of flight. The timing of the reflected pulse is accordingly not measured by Maimon and thus does not disclose or suggest the claimed robot or method.

For at least these reasons, Ruffner, either considered independently or in alleged combination with Maimon, does not disclose or suggest the robot or method of the independent claims. The independent claims are therefore submitted as being patentable. Moreover, it is submitted that the dependent claims 3, 10, 17 and 26 are allowable at least because of their dependency on independent claims 1, 8, 15 and 24, and for the additional features that they recite. Reconsideration is therefore requested.

For all of the above reasons, it is respectfully submitted that the pending claims are in condition for allowance and a Notice of Allowability is earnestly solicited.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact the Applicant's undersigned counsel at the telephone number, indicated below, to arrange for an interview to expedite the disposition of this application.

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Respectfully submitted,

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Enclosures: Petition for Extension of Time
Request for Continued Examination